Many factors cause leaf yellowing on these shrubs: iron deficiency due to high soil pH, use of new or undecomposed organic matter, poor internal drainage, excessive fertilizer application, root diseases, nematodes and/or insects. Consequently, before taking any corrective action, collect soil and plant tissue samples and have them analyzed.

If test results indicate an iron deficiency, apply a water-soluble iron fertilizer to the leaves, at the rate recommended on the label. Reapply if symptoms reappear.

If soil pH is above 6.0, apply 3–4 lb elemental sulfur or 20–30 lb iron sulfate per 1000 ft^2. Irrigate the treated area thoroughly to enhance reaction and remove any residue on the plants. Higher rates could damage plant roots by lowering soil pH too rapidly. Take a soil sample two to three months after any acidification process to determine if further adjustment is required.

For roses. Roses have a high calcium requirement. Lime recommendations are designed to maintain soil pH within a range of 6.0–6.5. A rate of 50 lb/1000 ft^2 is equivalent to spreading 1/2 cup around a plant to a distance of 18 inches. For best results, mix lime into the top 3–4 inches of soil.

Apply the recommended fertilizer in April or when the first flower buds appear. Apply additional nitrogen at rates of 0.5–1.0 lb/1000 ft^2 at monthly intervals through August. Water thoroughly following fertilizer application. Apply specially formulated fertilizers as indicated on the label.

For other ornamental shrubs. The fertilizer recommendation on the soil test report provides enough plant nutrients for one year. The best time to apply fertilizer is in early spring, usually one month prior to the most rapid growth period.

For individually transplanted shrubs, mix 0.25–0.5 lb of lime into the soil removed from the transplant hole before replacing it around the plant. Spread fertilizers evenly around the plant 10–12 inches from the base and water thoroughly.

In cases where many plants are being planted in beds, incorporate lime and fertilizer prior to setting plants. Ideally, you should incorporate any recommended lime several weeks before planting to allow adequate time to neutralize soil acidity.

For shade trees. The fertilizer rate given on the soil test report provides the nutrients required for the entire growing season. Apply fertilizer in February or March, prior to budding. Mature trees growing within a lawn seldom need any fertilizer beyond that applied to the lawn.

To fertilize individual trees, convert the rate from lb/1000 ft^2 to lb/inch of tree diameter. Multiply lb/1000 ft^2 by 0.05 when the tree is less than 6 inches and by 0.1 when the trunk is greater than 6 inches in diameter. Spread the fertilizer evenly around the tree starting 12 inches from the trunk and extending just beyond the drip line.

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NOTE 4: Fertilization of Lawns, Gardens and Ornamentals

Lime

Lime is a primary ingredient for improving the soil environment and promoting plant growth. Lime neutralizes soil acidity, improves soil tilth, stimulates microbial activity, enhances the availability of key nutrient elements and supplies the essential nutrients calcium and magnesium. No other amendment contributes so many benefits to the soil environment.

There are two types of lime used for agricultural purposes: calcitic and dolomitic. Calcitic limestone contains calcium carbonate ($CaCO_3$) but little or no magnesium. Dolomitic limestone contains both calcium and magnesium carbonates [$CaMg(CO_3)_2$] and has at least 120 lb Mg per ton.

Most bagged lime sold by farm suppliers and garden centers is a finely ground, high quality agricultural grade of dolomitic lime. Pelletized lime used as specified on the label should be equally as effective.

Lime recommendations on the soil test report are expressed in units of M, which is the same as lb/1000 ft^2. The rate suggested should raise the pH to 5.5 for centipedegrass, 6.0 for other lawn grasses, and 6.0 to 6.5 for gardens. The lime application should keep soil pH within the desired range for two to three years on sandy coastal-plain soils and for three to four years on silt and/or clay soils of piedmont and mountain regions.

For gardens and newly established lawns, broadcast lime over the surface and incorporate it 4–8 inches into the soil. For established lawns, gardens and ornamental shrubs, apply the recommended lime over the surface prior to rainfall or irrigation.

Do not surface-apply more than 50 lb of lime per 1000 ft^2 at any given time. If the suggested rate is higher, apply 50 lb initially and the remainder six months later. Lime residue will not harm plants and can be removed easily by irrigation or rainfall.

Apply lime based on a current soil test. Overliming can reduce the availability of certain micronutrients. This problem is common on sandy coastal-plain soils.

Fertilizer

The numbers on the fertilizer bag represent the grade of fertilizer: that is, the percentage of nitrogen (N), phosphate (P_2O_5) and potash (K_2O) contained in the material. All fertilizer grades are identified by the same label sequence (%N-%P_2O_5-%K_2O). For example, a 20-lb bag of 10-10-10 contains 2 lb of N, 2 lb of P_2O_5 and 2 lb of K_2O.

If you have a bag of 10-10-10 and want to apply 1 lb of nitrogen per 1000 ft^2, you would calculate the amount to apply as follows:

$$\frac{\textit{lb N desired / 1000 ft}^2}{\textit{\%N found in 10-10-10}} = \frac{1.0}{0.10} = 10 \text{ lb/1000 ft}^2$$

The number of pounds of the nutrient you want to apply per unit area divided by the grade percentage gives the amount of fertilizer to apply. Therefore, 10 lb of 10-10-10 supply 1.0 lb of N.

Use the same method for calculating the rate requirement from any fertilizer grade. The desired nutrients can also be obtained from single-nutrient fertilizers such as ammonium nitrate (34-0-0, 34% N) for N, muriate of potash (0-0-60, 60% K_2O) for K, and triple superphosphate (0-46-0, 46% P_2O_5) for P.

The rate of fertilizer recommended on the soil test report is in units of M, which is the same as lb/1000 ft^2. Read on for crop-specific information.

For lawns in general. The fertilizer rate given on the soil test report supplies enough phosphorus and potassium for an entire season. However, applying K_2O at a rate of 1.0 lb/1000 ft^2 in the fall improves the winter hardiness of warm-season grasses.

Table 1 gives the nitrogen fertilization schedules for common lawn grasses. The fertilizer rates on the soil test report supply 1.0 lb N per 1000 ft^2 for all lawn grasses, except centipedegrass. Subtract the nitrogen rates suggested on the soil test report from the total nitrogen shown in the table. Applying rates greater than those shown in Table 1 may enhance disease pressure, drought stress and winter injury.

For centipedegrass lawns. The recommended nitrogen fertilization rate for centipedegrass is only 0.5 lb/1000 ft^2. Nitrogen rates that are suitable for other lawn grasses cause excessive growth and winter injury on centipedegrass.

If you have a centipedegrass lawn and did not specify this when submitting your soil sample, your lime recommendation probably is in error. If this is the case, check the soil pH on your soil test report. If it is 5.5 or higher, do not apply any lime. If it is below 5.0, apply 50 percent of the lime recommended on the report.

Centipedegrass is sensitive to overliming. It turns yellow due to iron deficiency when soil pH is high. Consequently, if the pH is above 5.9, acidify the soil as described under the heading **For azalea, camellia, mountain laurel and rhododendron**.

If centipedegrass yellows due to an iron deficiency, a foliar application of iron will solve the problem temporarily. However, a nematode infestation can also cause similar symptoms. Therefore, if yellowing occurs, submit separate soil samples for nematode assay and soil fertility.

Table 1. Nitrogen fertilization (lb/1000 ft²)

For cool-season grasses*

	Feb	Sept	Nov
tall fescue	1	1	1
tall fescue & Ky. bluegrass	1	1	1
fine fescue & Ky. bluegrass	1	1	1
perennial ryegrass & Ky. bluegrass	1	1	1–2
Ky. bluegrass	1	1	1–2

For warm-season grasses*

	May	June	July	Aug
common bermuda	1	1	1	1
hybrid bermuda	1–1.5	1–1.5	1	1
centipedegrass	–	0.5	–	–
St. Augustine	1	0.5	1	0.5
zoysia	1	0.5	–	0.5
bahia	1	–	0.5	–

* The fertilizer recommended on the soil test report will supply the annual P_2O_5 and K_2O requirements. Choose a fertilizer that will not exceed the nitrogen rate recommended for specific application periods. This table gives additional nitrogen requirements and specified times of application.

For vegetable and flower gardens. Spread the recommended amount of fertilizer uniformly over your garden plot. Incorporate it 4–6 inches into the soil before seeding or transplanting. This method of application reduces the potential of salt injury to germinating seeds or young transplants.

Alternatively, broadcast about 3/4 of the fertilizer over the soil surface and incorporate it. Band the remainder in the row: 2–3 inches to the side and 2 inches below the seed at or prior to planting. Keep in mind that fertilizers are salts. Applying too much can have adverse effects on seed germination or on young transplants.

Certain vegetable crops require additional nitrogen during the growing season. Side-dress the extra nitrogen at the rates and times specified in Table 2. Irrigate following application to enhance movement of nutrients into the root zone.

For azalea, camellia, mountain laurel and rhododendron. These plants have similar requirements. They are acid-loving plants and grow best when the soil pH ranges from 4.8 to 5.5. Azalea and camellia fertilizers are generally acid-forming, which is an added benefit if the soil pH is too high (above 6.0).

The rate recommended on the soil test report supplies 1 lb N per 1000 ft^2, which is sufficient for one year's growth. However, splitting fertilizer treatments into three equal applications, as follows, will produce more uniform growth and minimize leaching: 1/3 in early April, 1/3 in June or July and 1/3 in September.

Table 2. Supplemental nitrogen for vegetables

Crop	Rate (lb/1000 ft²)	Schedule
tomatoes	0.5–1	2 applications at monthly intervals after 1st bloom
potatoes	1.5–2	1 month after emergence
sweet corn	1.5–2	1 month after emergence
cabbage	0.5–1	1 month after transplanting
squash	0.5–1	1 month after emergence
okra	0.5–1	when plants are 2 ft high
beans	0.5–1	1 month after emergence
peppers	0.5–1	1 month after transplanting